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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,160	10/29/2003	Howard E. Rhodes	M4065.0939/P939	7143
24998	7590	10/12/2005	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP				HO, TU TU V
2101 L Street, NW				ART UNIT
Washington, DC 20037				PAPER NUMBER
				2818

DATE MAILED: 10/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/695,160	RHODES, HOWARD E.	
	Examiner Tu-Tu Ho	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 04 August 2005.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-240 is/are pending in the application.
 4a) Of the above claim(s) 51-234 and 236-240 is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-50 and 235 is/are rejected.
 7) Claim(s) 17,20 and 33 is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 29 October 2003 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date _____.
 4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date _____.
 5) Notice of Informal Patent Application (PTO-152)
 6) Other: _____.

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 10/29/2003 is acceptable.

Election/ Restriction

2. Applicant's election with traverse of Species I, claims 1-29 and 235, in the reply filed on 08/04/2005 is acknowledged. The traversal is on the ground(s) that (1) Species I, similarly to Species II, includes a third (sub-) region (third sub-region, claim 5, a separation region, claim 235); that (2) it would not be a serious burden to examine all of the claims; and that (3) the examiner has issued previous Restriction/Election Requirement. This is not found persuasive because (1) the third sub-region or the separation region of Species I is not the same as the third region of Species II; because (2) it would be a serious burden to examine all the claims as the third region is not the same as the third sub-region or the separation region; and because (3) there is no restriction as to how often an examiner could impose Restriction/Election Requirements.

Nevertheless, Applicant is correct in pointing out that Species I should also include claims 30-50. Accordingly, claims 1-50 and 235 are under examination at this time.

3. Claims 123-233 and 240 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 02/22/2005.

Claims 237 and 238 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 05/04/2005.

Claims 68-122, 234, 236, and 239 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 06/27/2005.

Claims 51-67 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 08/04/2005, as noted above.

Drawings

4. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because they are not legible, for example Fig. 4, reprinted below or next page. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

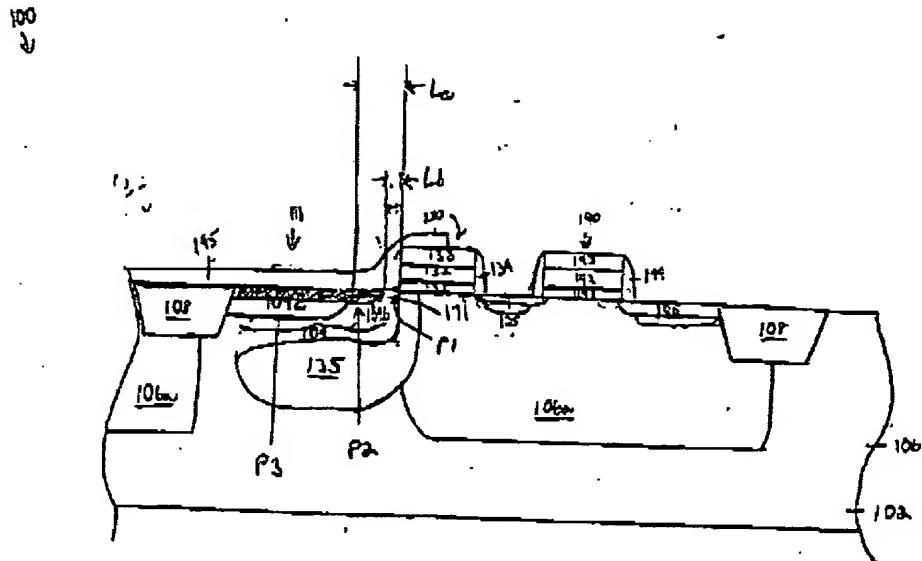


Figure 4

Claim Objections

5. - Claim 20 is objected to because of the following informalities: Claim 20 recites: "The photoconversion device of claim 4, wherein said second doped sub-region has a shallower doping profile than said first doped region". However, because said second doped sub-region is a part of said first doped region, it appears to be meaningless to compare the part with the whole (a comparative example is: the door of the house is smaller than the house).

For examination purposes, the claim is interpreted to be: "The photoconversion device of claim 4, wherein said second doped sub-region has a shallower doping profile than said first doped sub-region".

- Claim 33 is objected to because of the following informalities: Claim 33 recites: “wherein said first region doped has a first dopant concentration” which appears to contain a typographical error.

For examination purposes, the claim is interpreted to be “wherein said first doped region has a first dopant concentration”.

- Claim 17 is objected to because of the following informalities: Claim 17 recites: “wherein said first and second doped region is implanted with BF₂ or B¹¹ dopant ions” which is not disclosed in the specification. It is clear that claim 17 should recite, and so interpreted for examination purposes, “wherein said first and second doped sub-regions are implanted with BF₂ or B¹¹ dopant ions”.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. **Claims 30-37, 40-44, 46-50, and 235** are rejected under 35 U.S.C. 102(e) as being anticipated by Patrick U.S. Patent Application Publication 20040173799 (hereinafter the '799 reference).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

The '799 reference discloses in the figures, particularly Fig. 19, and respective portions of the specification a photoconversion device as claimed.

Referring to **claim 30**, the '799 reference discloses a photoconversion device comprising:
a substrate (110, Fig. 19) having a surface;
a first region (170 or 270) doped to a first conductivity type (p, Figs. 7-19, paragraphs [0075] to [0077]) located below the surface of the substrate;
a second region (280, Fig. 19, reference 280 added by the examiner for ease of explanation) adjacent to said first region; and
a third region (126 or 226) doped to a second conductivity type (n, paragraph [0079]) located beneath said first doped region for collecting photogenerated charges (paragraph [0045]).

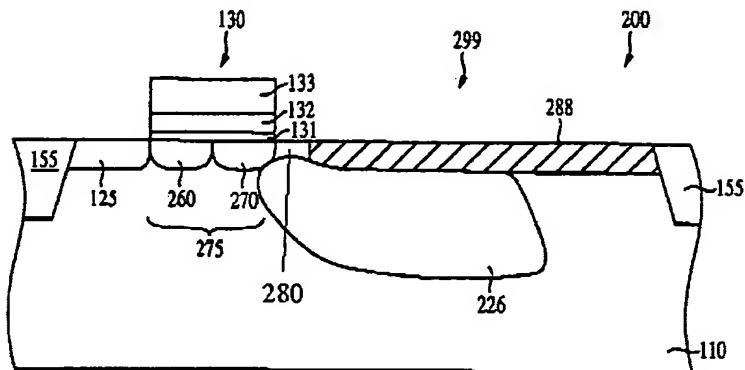


FIG. 19

Note: Numerical Reference 280 added by the examiner for ease of explanation

Referring to **claim 235** and using the same reference characters, citations, and interpretation as detailed above for claim 30 where applicable, the reference discloses a photoconversion device comprising:

a substrate having a surface;

a first region (270) doped to a first conductivity type located below the surface of the substrate, said region having a dopant gradient profile;

a separation region (280); and

a second region (226) doped to a second conductivity type located beneath said first doped region and separation region for collecting photogenerated charges

Referring to **claim 31**, the reference further discloses that said first conductivity type is p-type, as noted above.

Referring to **claim 32**, the reference further discloses that said first conductivity type is n-type, as noted above.

Referring to **claim 33**, the reference further discloses that said first doped region has a first dopant concentration.

Referring to **claim 34**, the reference further discloses that said second region (280) does not have a dopant concentration of said first conductivity type.

Referring to **claims 35-37**, the reference further discloses a first dopant concentration as claimed (paragraph [0075], and note that the reference discloses the concentration in a three-dimensional format as opposed to the claimed two-dimensional format, but the claimed and the disclosed are about the same for all practical purposes; for a conversion between the two formats, as far as dopant concentration in the pertinent art is concerned, see, for example Farb U.S. Patent 5,006,477, column 2, lines 46-67).

Referring to **claim 40**, the reference further discloses that said first doped region is implanted with BF₂ or B¹¹ dopant ions (“boron”, paragraph [0075]).

Referring to **claims 41-42 and 49-50**, the limitations “wherein said dopant ions are implanted with an implant energy of from about 1 keV to about 40 keV” and “wherein said third doped region is formed with an implant energy of from about 30 keV to about 300 keV” are “product-by-process” limitations and are considered non-limitation in a device claim.

Referring to **claim 43**, the reference further discloses that said photoconversion device is part of a CMOS imager (paragraph [0003]).

Referring to **claim 44**, the reference further discloses that said photoconversion device is a 3-T device (paragraph [0003], the photogate constitutes 1T, a transferring transistor constitutes another T, and a resetting transistor constitutes yet another T).

Referring to **claim 46**, the reference further discloses that said second conductivity is provided from the group comprising of arsenic, antimony, or phosphorus ions (paragraphs [0079] and [0063]).

Referring to **claims 47-48**, the reference further discloses that said third doped region (126 or 226) is formed with an angled implantation having an angle from about 0 to about 89 degrees (paragraph [0063]: “different than a 90 degree”).

7. **Claims 1-6,12,17-22,24,25,28-34,40-43,45,46,49,50 and 235** are rejected under 35 U.S.C. 102(b) as being anticipated by Kawakami et al. U.S. Patent Application Publication 20020047115 (hereinafter the ‘115 reference).

The ‘115 reference discloses in the figures, particularly Figs. 56D and 58E, and respective portions of the specification a photoconversion device as claimed.

Referring to **claim 1**, the ‘115 reference discloses a photoconversion device comprising: a substrate (301, Fig. 58E) having a surface; a first region (304/305, Fig. 58D; or 104/105, Fig. 56D) doped to a first conductivity type (p) located below the surface of the substrate, said region having a graded profile (a first profile for 305 or 105 and a second profile, different from the first profile, for 304, paragraphs [0121], [0127] and [0131]); and

a second region (333/332) doped to a second conductivity type (n) located beneath said first doped region for collecting photogenerated charges (“charge storing”, paragraph [0127]).

Referring to **claim 2**, the reference further discloses that said first conductivity type is p-type, as noted above.

Referring to **claim 3**, the reference further discloses that said second conductivity type is n-type, as noted above.

Referring to **claim 4**, the reference further discloses that said graded profile (a first profile for 305 or 105 and a second profile, different from the first profile, for 304, paragraphs [0121], [0127] and [0131]) further comprises a first sub-region (305 or 105; or 304) doped to a first dopant concentration and a second sub-region (304; or 305 or 105) doped to a second dopant concentration.

Referring to **claim 5**, the reference further discloses a third sub-region (such as a sub-region of the thermal oxide region 313 or the sub-region of the substrate 301 underlying and in contact with the second sub-region 305) having no dopant ions from said first and second doped sub-regions.

Referring to **claims 6 and 12**, the reference further discloses that said first dopant concentration (of the first sub-region 305 or 105) is a p+ dopant concentration (paragraph [0121], dosage of $5 \times 10^{12}/\text{cm}^2$) and said second dopant concentration (of the second sub-region 304) (paragraph [0121], dosage of $1 \times 10^{12}/\text{cm}^2$) is less than a p+ dopant concentration, and that said first dopant concentration is greater than said second dopant concentration.

Referring to **claim 17**, the reference further discloses that said first and second doped sub-regions are implanted with BF₂ or B¹¹ dopant ions (“boron”, paragraph [0127]).

Referring to **claims 18-19 and 28-29**, the limitations “wherein said dopant ions are implanted with an implant energy of from about 1 keV to about 40 keV” and “wherein said second doped region is formed with an implant energy of from about 30 keV to about 300 keV” are “product-by-process” limitations and are considered non-limitation in a device claim.

Referring to **claim 20**, the reference further discloses that said second doped sub-region (304) has a shallower doping profile than said first doped region (305).

Referring to **claim 21**, the reference further discloses that said second doped sub-region (304 or 305) is adjacent to an undoped sub-region (such as a sub-region of the thermal oxide region 313 or the sub-region of the substrate 301 underlying and in contact with the second sub-region 305 or being adjacent to second sub-region 304).

Referring to **claim 22**, the reference further discloses that said photoconversion device is part of a CMOS imager (paragraph [0138], “MOSFETs”).

Referring to **claim 24**, the reference further discloses that said photoconversion device is part of a CCD imager (paragraph [0138]).

Referring to **claim 25**, the reference further discloses that said second conductivity (n) is provided from the group comprising of arsenic, antimony, or phosphorus ions (paragraphs [0127] and [0131]).

Referring to **claim 30**, the ‘115 reference discloses a photoconversion device comprising:
a substrate (301, Fig. 58E) having a surface;
a first region (304/305, Fig. 58D; or 104/105, Fig. 56D) doped to a first conductivity type (p; paragraphs [0121], [0127] and [0131]) located below the surface of the substrate;
a second region (such as a sub-region of the thermal oxide region 313 or the sub-region of the substrate 301 underlying and in contact with the second sub-region 305) adjacent to said first region; and

a third region (333/332) doped to a second conductivity type (n, paragraph [0127]) located beneath said first doped region for collecting photogenerated charges (“charge storing”, paragraph [0127]).

Referring to **claim 235** and using the same reference characters, citations, and interpretation as detailed above for claim 30 where applicable, the reference discloses a photoconversion device comprising:

 a substrate having a surface;
 a first region doped to a first conductivity type located below the surface of the substrate, said region having a dopant gradient profile;
 a separation region (such as a sub-region of the thermal oxide region 313 or the sub-region of the substrate 301 underlying and in contact with the second sub-region 305); and
 a second region (333/332) doped to a second conductivity type located beneath said first doped region and separation region for collecting photogenerated charges

Referring to **claim 31**, the reference further discloses that said first conductivity type is p-type, as noted above.

Referring to **claim 32**, the reference further discloses that said first conductivity type is n-type, as noted above.

Referring to **claim 33**, the reference further discloses that said first doped region has a first dopant concentration.

Referring to **claim 34**, the reference further discloses that said second region (such as a sub-region of the thermal oxide region 313 or the sub-region of the substrate 301 underlying and in contact with the second sub-region 305) does not have a dopant concentration of said first conductivity type.

Referring to **claim 40**, the reference further discloses that said first doped region is implanted with BF₂ or B¹¹ dopant ions (“boron”, paragraph [0127]).

Referring to **claims 41-42 and 49-50**, the limitations “wherein said dopant ions are implanted with an implant energy of from about 1 keV to about 40 keV” and “wherein said third doped region is formed with an implant energy of from about 30 keV to about 300 keV” are “product-by-process” limitations and are considered non-limitation in a device claim.

Referring to **claim 43**, the reference further discloses that said photoconversion device is part of a CMOS imager (paragraph [0138]).

Referring to **claim 45**, the reference further discloses that said photoconversion device is part of a CCD imager (paragraph [0138]).

Referring to **claim 46**, the reference further discloses that said second conductivity (n) is provided from the group comprising of arsenic, antimony, or phosphorus ions (paragraphs [0127] and [0131]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 7-11,13-16,23,26,27,35-39,44,47 and 48 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kawakami et al. U.S. Patent Application Publication 20020047115 (hereinafter the ‘115 reference).

Referring to **claims 7-10**, the ‘115 reference discloses a photoconversion device as claimed and as detailed above for claim 6 including said first dopant concentration (of the first

sub-region 305 or 105), which is a p+ dopant concentration (paragraph [0121], dosage of $5 \times 10^{12}/\text{cm}^2$), and said second dopant concentration (of the second sub-region 304) (paragraph [0121], dosage of $1 \times 10^{12}/\text{cm}^2$) which is less than the p+ dopant concentration, however, the reference fails to disclose certain range of values as claimed. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, said second dopant concentration being less than said first dopant concentration as taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Referring to **claim 11**, although the reference does not discloses that said p+ doped sub-region primarily sets the pinning voltage of said photoconversion device, it appears that said p+ doped sub-region primarily sets the pinning voltage of said photoconversion device as the claimed structure and the disclosed structure are about the same.

Referring to **claims 13-14**, the '115 reference discloses a photoconversion device as claimed and as detailed above for claim 4 wherein said graded profile (a first profile for 305 or 105 and a second profile, different from the first profile, for 304, paragraphs [0121], [0127] and [0131]) further comprises a first sub-region (305 or 105; or 304) doped to a first dopant concentration and a second sub-region (304; or 305 or 105) doped to a second dopant concentration. The reference further teaches that the first doped sub-region 304 is formed with an angled implantation (paragraph [0131]: "skew implantation", Figs. 58D and 58E). However, the reference fails to teach an angle as claim. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, a range of different angles of

the disclosed skew implantation taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Referring to **claims 15-16**, the '115 reference discloses a photoconversion device as claimed and as detailed above for claim 4 wherein said graded profile (a first profile for 305 or 105 and a second profile, different from the first profile, for 304, paragraphs [0121], [0127] and [0131]) further comprises a first sub-region (305 or 105; or 304) doped to a first dopant concentration and a second sub-region (304; or 305 or 105) doped to a second dopant concentration. The reference further teaches that the second doped sub-region 304 is formed with an angled implantation (paragraph [0131]: "skew implantation", Figs. 58D and 58E). However, the reference fails to teach an angle as claim. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, a range of different angles of the disclosed skew implantation taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Referring to **claims 23 and 44**, the reference discloses a photoconversion device as claimed and as detailed above for claim 22 wherein said photoconversion device is part of a CMOS imager, but fails to teach that said CMOS imager is a 3T, 4T, 5T, 6T, or 7T device (where T is transistors). However, since the reference also fails to limit the number of transistors that could be used with the CMOS imager, it would be obvious to one of ordinary skill in the art to form the CMOS imager such that it contains as many transistors as needed.

Referring to **claims 26-27**, the '115 reference discloses a photoconversion device as claimed and as detailed above for claim 1 including said second doped region 333/332. The reference further teaches that the second doped region 333/332 is formed with an angled implantation (paragraph [0130]: "skew implantation", Figs. 58D and 58E). However, the reference fails to teach an angle as claim. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, a range of different angles of the disclosed skew implantation taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Referring to **claims 35-37**, the reference discloses a first dopant concentration for the first doped region 304/305 but fails to disclose a range of values as claimed. Specifically, the reference discloses in paragraph [0121] a dosage of $1-5 \times 10^{12}/\text{cm}^2$ for the sub-region 305 and in paragraph [0121] a dosage of $1 \times 10^{12}/\text{cm}^2$ for sub-region 304. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, said ranges of dosages for the sub-regions of the first doped region, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Referring to **claims 38-39**, the '115 reference discloses a photoconversion device as claimed and as detailed above for claim 30 wherein said first doped region (304) is formed with an angled implantation (paragraph [0131]: "skew implantation", Figs. 58D and 58E). However, the reference fails to teach an angle as claim. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values,

namely, a range of different angles of the disclosed skew implantation taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Referring to **claims 47-48**, the '115 reference discloses a photoconversion device as claimed and as detailed above for claim 30 including said second doped region 333/332. The reference further teaches that the second doped region 333/332 is formed with an angled implantation (paragraph [0130]: "skew implantation", Figs. 58D and 58E). However, the reference fails to teach an angle as claim. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, a range of different angles of the disclosed skew implantation taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Tu-Tu Ho
October 07, 2005